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UNITED STATES PATENT APPLICATION

Title:

**RACK FOR CARRYING ENLONGATED OBJECTS
ON THE VERTICAL BACK OF A VEHICLE**

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1 **RACK FOR CARRYING ELONGATED OBJECTS**
2 **ON THE VERTICAL BACK OF A VEHICLE**

3 **Background of the Invention**

4 Technical Field of the Invention

5 This invention relates to racks for carrying sporting goods, elongated items, and the like
6 on the substantially vertical backs of vehicles such as motor homes.

7 Background Art

8 Racks have been developed for carrying a wide variety of objects on the outside of
9 various motor vehicles. Pickup trucks have been adapted with racks for carrying lumber, ladders,
10 pipe, and other elongated objects in a horizontal position, with the objects being supported by a
11 rear lateral bar generally even with the tailgate of the truck, and by a front lateral bar above the
12 passenger cab. These pickup truck racks mount to the vertical holes in the sides of the bed box.
13 Sedans have been adapted with racks for carrying bicycles, kayaks, and other objects in a
14 generally horizontal position above the roof of the passenger compartment. These sedan racks
15 mount to the roof, either to the rain gutters, to the roof at the “door frames”, or to factory rack
16 mounts, or in some instances to the trunk. SUVs have been adapted with racks for carrying
17 bicycles behind the rear doors or lift gate, with the bicycle frames hanging from a horizontal rack
18 bar which extends longitudinally backward from the vehicle, with the bicycles positioned
19 sideways. These SUV racks typically mount to the trailer hitch. Hatchbacks and wagons have
20 been adapted with racks for carrying bicycles in this same sideways, frame-hung manner. These
21 racks mount to the lift gate.

22 In addition to bicycle racks and the like, manufacturers have recently begun offering
23 hitch-mounted racks or trays for carrying toolboxes, coolers, and the like.

24 With the exception of original factory racks, it is generally understood to be desirable that
25 rack installations not cause any permanent alteration, damage, or structural changes to the
26 vehicle. Such alteration or damage would reduce the resale value of the vehicle, as well as the
27 vehicle’s aesthetic appeal to the current owner.

28 One group of vehicles has, until the advent of the present invention, been much neglected
29 and underserved by the aftermarket rack industry. There have not previously been any racks

1 available which have been optimized for use with motor homes, motor coaches, recreational
2 vehicles (RVs), campers, trailers, and other vehicles which have a substantially vertical rear end
3 or stern. It is a common sight to see an RV driving down the highway with a variety of items
4 strapped to its roof, often with additional items hanging from its rear roof access ladder and even
5 its spare tire.

6 Until now, RV owners had to carry elongated cargo, such as surfboards, canoes, kayaks,
7 and ladders, to the roof and strap it down in a horizontal position. This exposes the cargo directly
8 to the full blast of the passing air and weather, adds to the already significant air resistance of the
9 vehicle, and is dangerous and inconvenient for the owner, who is forced to scale the vehicle's
10 ladder (or, worse, a separate ladder) with unwieldy cargo. Furthermore, it is dangerous for other
11 motorists, as the items are sometimes blown off the roof, landing in traffic.

12 What is needed, then is an improved apparatus and method for securing elongated cargo
13 items to the back of a vehicle which has a substantially vertical or a significantly tall rear end.

14 **Brief Description of the Drawings**

15 The invention will be understood more fully from the detailed description given below
16 and from the accompanying drawings of embodiments of the invention which, however, should
17 not be taken to limit the invention to the specific embodiments described, but are for explanation
18 and understanding only.

19 FIG. 1 shows an RV equipped with one embodiment of a rack according to the present
20 invention, illustrating the rack configured for carrying surfboards.

21 FIG. 2 shows the RV with its rack configured for carrying a canoe.

22 FIG. 3 shows an exploded view of the components of one embodiment of a rack such as
23 may be used with an RV.

24 FIG. 4 shows the tray with its pass-through hitch system in greater detail.

25 FIG. 5 shows the rack system before installation onto the RV.

26 FIG. 6 shows details of an alternate bumper mounting system.

27 FIG. 7 shows an exploded view of the alternate bumper mounting system.

Detailed Description

In this disclosure, the term “longitudinal” refers to the generally front-to-back direction, or the direction of travel of the vehicle, while the term “lateral” refers to the generally left-to-right direction.

FIG. 1 illustrates a vehicle 10, such as an RV, equipped with a rack system 12 according to one embodiment of this invention. The rack system includes a rack 14 and an optional tray 16. In some applications, it will be desirable to have a tray or the like to support the majority of the weight of items being carried in the rack. In other applications, the rack carries the majority of the weight of the items.

Ideally, the rack is mounted to the bumper 18 of the RV by bumper mounts 20. In other embodiments, the rack may be supported by the tray or other components of the RV, such as the trailer hitch, but mounting to the bumper will generally provide the most positive mounting, with the greatest resistance to rocking and swaying.

The bumper mounts support vertical rails 22 which, in turn, support horizontal rails. In one embodiment, there is a bottom horizontal rail 24, a middle horizontal rail 26, and a top horizontal rail 28. Various ones of the rails, such as the top and middle horizontal rails, are equipped with support bars 30 which hold cargo, such as surfboards 32, in position. The support bars are movable along the rails. In some embodiments, the support bars are equipped with locking mechanisms (not shown) which enable the user to positively position them to hold the cargo in a fixed position.

Ideally, the rack is not connected to the body of the RV, and is supported only at the bumper. The rails may be provided with pads 34 which protect the RV from damage by any contact from the rails. In some embodiments, the rack is configured such that the pads are kept in constant contact with the RV, to improve the longitudinal stability of the rack. For example, compression springs 35 may provide longitudinal pressure between the bumper mounts and the vertical rails, rotating the vertical rails toward the RV.

In one embodiment, the horizontal rails can be moved and positioned along the vertical rails, whether it be to position the support bars for particular cargo items, or to avoid vehicle components such as a spare tire 36 or a rear window 38.

1 The tray 16, or other suitable mechanism such as a bar, supports the weight of the cargo
2 items held in the rack. In some embodiments, the tray is stabilized by stabilizer bars 39 which are
3 coupled to the tray (ideally, near its left and right ends for maximum leverage) and to the rack, to
4 reduce any tendency of the tray to rock or yaw. In one embodiment, the stabilizer bars are
5 coupled to the bumper mounts. In other embodiments, the stabilizer bars may be coupled to the
6 vertical rails, the bumper, the RV frame, or the hitch. In some embodiments, the stabilizer bars
7 may be replaced by chains, straps, or other devices for stabilizing the tray by keeping it under
8 tension.

9 Additionally, the tray provides storage for other items which are not suitable for being
10 carried in the rack, such as a small barbeque 40. In one embodiment, the tray is equipped with a
11 permanently affixed lockbox 42 for securing small valuables. Surfers have a known problem of
12 securing their wallets, RV keys, and other valuables which cannot be left inside the RV, but
13 which are readily lost if the person carries the items while surfing, and which are often stolen if
14 left on the beach. Ideally, the lockbox has a combination lock, such that the user does not need to
15 take a lockbox key with them or try to hide it on the beach.

16 In one embodiment, the tray is mounted to the RV's receiver hitch (not visible). In other
17 embodiments, it may be coupled to the bumper. In either case, the user may have a trailer or a
18 towed vehicle which is also needed. To facilitate this, the tray provides its own receiver 44 to
19 which a hitch 46 may be coupled, for towing the trailer or vehicle, or perhaps for daisy-chaining
20 a second tray.

21 FIG. 2 illustrates the RV 10 with the support bars repositioned for holding a canoe 48.
22 The horizontal rails can be provided with any suitable number of support bars. Some of the
23 support bars may be repositionable, while others may be permanently mounted in a fixed
24 position.

25 In the interest of simplicity, the drawings do not show the various means by which
26 surfboards, canoes, and the like may be secured to the rack. In some cases, the cargo can be
27 attached with ropes or bungee cords, or with motorcycle tie-down straps, or the like. In some
28 embodiments, the rails or the support bars may be provided with locking mechanisms to prevent
29 removal of the cargo items. One especially useful embodiment includes a retractable, ratcheting
30 cable which can be pulled out from the open end of a support bar and locked onto an adjacent

1 support bar. This is especially useful with cargo items which, owing to their shape or to their
2 bulk, cannot easily be removed simply by sliding them upward until they clear the support rails.
3 For example, the fin of a surfboard will prevent the surfboard from passing upward between
4 support bars which have been positioned firmly against the top and bottom of the surfboard.

5 FIG. 3 illustrates an exploded view of the components of one embodiment of a rack 12.
6 The rack includes bumper mounts 20 for connecting to the vehicle. The bumper mounts are
7 coupled to the vertical rails 22 and/or the bottom horizontal rail 24. The horizontal rails are
8 slidably connected to the vertical rails by rail connectors 50. Some or all of the rail connectors
9 may have means (not shown) for locking them in place, such as set-screws, cam levers, or the
10 like which enable the rails to be moved to and held in any arbitrary position, or means (not
11 shown) for moving to and holding in predetermined positions, such cotter pins or as the
12 well-known system of holes and snap-out buttons which are used in many telescoping tent and
13 canopy legs.

14 The horizontal rails (and, optionally, the vertical rails) are equipped with support bars 30
15 for holding cargo items in place. Some of the support bars may be directly coupled to the rails,
16 such as by welding, while others may be coupled by bar connectors 52. The bar connectors may
17 be provided with positioning means such as those provided for the rail connectors. A support bar
18 includes a rod or tube 54 and, optionally, a pad 56.

19 In some embodiments, the bumper connectors are rigidly coupled to the vertical rails. In
20 other embodiments, the bumper connectors are pivotably connected to the vertical rails, such as
21 by hinge pins or bolts 58. In some such embodiments, compression springs 35 may be provided
22 to keep the rack against the vehicle under tension.

23 In some embodiments, the bar connectors and the pads 34 are slid onto the rails before
24 the rail connectors are in place. In other embodiments, the bar connectors and even the rail
25 connectors may be configured such that they can be added later, without disassembling the rails.

26 In some embodiments, other or additional means may be provided for preventing the rack
27 and/or the cargo from damaging the back of the RV. For example, the rack or the RV may be
28 equipped with adhesive-backed rubber buttons such as those used to prevent bug deflectors from
29 vibrating against the hoods of pickup trucks.

1 The tray may be equipped with fixed or movable pads for supporting damageable items
2 such as surfboards. The tray may be equipped with various means for facilitating tie-down of the
3 goods in the tray and in the rack, such as eyebolts to which the user may connect surfboard
4 leashes. The tray may be manufactured of expanded steel. The tray may be provided with a
5 variety of adapters or reducers for coupling to a variety of hitches and receivers.

6 The bumper connectors may have any suitable shape. They may simply slip down over
7 the bumper, or they may slide in over the ends of the bumper. They should be held in place some
8 positive retention means such as rubber-backed clamps, bolts, screws, locks, or the like. In some
9 embodiments, the user may remove the rack while leaving the tray in place, or vice versa.

10 The user might use the support bars to hold items in a horizontal position, rather than
11 vertically as shown.

12 While the rack has been illustrated with reference to an embodiment in which the
13 horizontal rails can be slid to various positions along the vertical rails, there are also
14 embodiments in which the opposite is true, in which the vertical rails slide laterally along the
15 horizontal rails. And while the connectors have been illustrated in a T configuration, other
16 configurations are certainly within the scope of this invention, such as L shapes. And while the
17 connectors have been illustrated as holding the vertical and horizontal rails in substantially the
18 same plane, in other embodiments, they could occupy different, parallel planes such that both the
19 horizontal rails and the vertical rails may extend beyond the other, providing maximum
20 flexibility in configuration (whereas, in the embodiment illustrated in Fig. 1, the lateral
21 separation of the vertical rails is dictated by the length of the horizontal rails).

22 The numbers of rails need not be exactly as shown. The rails may be manufactured of any
23 suitable material, such as square box galvanized steel, round aluminum tubing, fiberglass, or
24 other materials.

25 FIG. 4 illustrates the daisy-chain or pass-through hitch system 60. The vehicle (not
26 shown) includes a receiver hitch 62 which includes means 64 for coupling to the frame of the
27 vehicle. The receiver hitch includes an open-ended receiver 66, which typically includes a lateral
28 hole 68. The tray 16 includes a box 70 coupled to a frame 72. The frame includes a hitch 74
29 which is sized for mating with the receiver 66, and typically includes a lateral hole 76. The hitch
30 is inserted into the receiver until the lateral holes are aligned, a retaining pin 78 is inserted

1 through the holes, and a cotter pin 80 is engaged with the retaining pin to keep it from coming
2 loose.

3 The box may be equipped with a variety of equipment such as a lockbox 42, tie-down
4 points such as eyebolts 82, and so forth. The box may further include removable equipment 40
5 and a variety of pads 84 for cushioning the supported ends of surfboards and the like.

6 The tray frame may optionally include a receiver 44 with a lateral hole 86, to enable the
7 addition of a hitch 46 for towing a trailer even with the tray occupying the vehicles hitch
8 receiver. The hitch 46 includes a lateral hole 88 and a ball 90. The hitch is inserted into the tray
9 receiver until the lateral holes are aligned, and a second retaining pin 92 and cotter pin 94 secure
10 the hitch to the tray. Alternatively, the ball may be coupled directly to the tray without a
11 removable hitch.

12 This daisy-chaining feature may be built into a variety of other rack systems which
13 occupy the vehicle's receiver, and is not necessarily limited to use with trays. For example, it
14 could be used in conjunction with a hitch-mounted bicycle rack, enabling a car owner to
15 simultaneously carry her mountain bikes and tow her camping trailer.

16 FIG. 5 illustrates the rack system 12 prior to its installation onto the RV 10. The rack
17 system includes a rack 14 having bumper couplers 20 which are installed onto the RV's bumper
18 18. The rack system also includes a tray 16 having a hitch 74 which is installed into the RV's
19 hitch receiver 66. The tray also has stabilizer bars 39 which are coupled to the bumper couplers,
20 typically after the rack is installed on the bumper and the tray is installed in the hitch receiver.

21 FIG. 6 illustrates an alternate bumper mounting system, which couples to the bumper 18
22 in a somewhat different manner than the system described above. The bumper is illustrated as
23 viewed from the right rear of the RV (not shown). The bumper coupler includes a main bracket
24 100 which fits behind the bumper and a bottom bracket 102 which fits beneath the bumper. In
25 some embodiments, the main bracket and the bottom bracket are a monolithic structure, as
26 shown. An outer bracket 104 and the main bracket sandwich the bumper and are held firmly in
27 place by bolts 106.

28 A vertical rail 22 of the rack slips into or over the main bracket, and is held in place by a
29 bolt (not shown) or by a padlock 108. A stabilizer bar 110 slips into or over the bottom bracket,
30 and is held in place by a bolt 112 or a padlock (not shown).

1 FIG. 7 illustrates this alternate bumper mounting system in an exploded view. The bolts
2 106 which hold the outer bracket 104 and the main bracket 100 to the bumper are secured by
3 nuts 114 or by other suitable means such as locks, welds, or the like. The bolt 112 which holds
4 the stabilizer bar 110 to the bottom bracket 102 is secured by a nut 116 or by other suitable
5 means.

6 While the invention has been described with reference to coupling the rack to the back
7 end of the RV, the invention may be practiced in other situations, as well, such as in the form of
8 a rack adapted for coupling to the front bumper, or a rack for coupling to a bumper or rail
9 attached to a vertical side of the RV. And while the invention has been described with reference
10 to its use with an RV, it may of course be adapted for use with a variety of other vehicles, such
11 as trailers, campers, SUVs, passenger cars, boats, and so forth. Most typically, such vehicles will
12 have a frame, with a body coupled to the frame. The hitch receiver is usually coupled to the
13 frame.

14 The various features illustrated in the figures may be combined in many ways, and should
15 not be interpreted as though limited to the specific embodiments in which they were explained
16 and shown. Those skilled in the art having the benefit of this disclosure will appreciate that many
17 other variations from the foregoing description and drawings may be made within the scope of
18 the present invention. Indeed, the invention is not limited to the details described above. Rather,
19 it is the following claims including any amendments thereto that define the scope of the
20 invention.